

## CLAIMS

Having thus described our invention, what we claim as new and desire to secure by Letters Patent is:

1. A semiconductor structure comprising:

a substrate;

two or more adjacent conductors, disposed in at least one dielectric layer formed over said substrate, wherein each pair of adjacent conductors is separated by a gap; and

a first high dielectric constant material formed in the gap between two adjacent conductors.

2. The semiconductor structure of Claim 1, wherein at least one successive conductor level comprising at least one conductor is provided over the adjacent conductors, further comprising second high dielectric constant material disposed between at least one of the adjacent conductors and the at least one successive conductor level.

3. The semiconductor structure of Claim 1 wherein the high dielectric constant material is selected from the group consisting of ferroelectrics, relaxors, paraelectrics, perovskites, pyrochlores, layered perovskites or any material with a dielectric constant which is greater than 10.

4. The semiconductor structure of Claim 1 wherein the conductors are fabricated from at least one of the group consisting of Au, Pt, Pd, Ir, Rh, Ru, Mo, Al, Cu, W, their alloys, and doped polysilicon.

5. The semiconductor structure of Claim 1 further comprising a diffusion barrier material formed between said high dielectric constant material and said conductors.

6. The semiconductor structure of Claim 5 wherein the diffusion barrier material is selected from the group consisting of RuO<sub>2</sub>, IrO<sub>2</sub>, Re<sub>2</sub>O<sub>3</sub>, TiN, TaN and TaSiN.

7. The semiconductor structure of Claim 1 wherein at least one pair of adjacent conductors comprises a power supply line and a ground wire.

8. The semiconductor structure of Claim 2 wherein at least one pair of adjacent conductors comprises a pair of metal lines.

9. The semiconductor structure of Claim 8 wherein the at least one successive conductor level comprises a first successive level comprising at least one conductive via electrically coupled to at least one of the pair of metal lines.

10. The semiconductor structure of Claim 9 wherein the at least one successive conductor level additionally comprises a second conductor level comprising additional adjacent conductors disposed above the first successive level.

11. The semiconductor structure of Claim 10 wherein the second conductor level additionally comprises third high dielectric constant material disposed between the additional adjacent conductors.

12. The semiconductor structure of Claim 2 further comprising at least one electrically conductive barrier material disposed between the second high dielectric constant material and the at least one conductor.

13. The semiconductor structure of Claim 11 further comprising at least one electrically conductive barrier material disposed between the third high dielectric constant material and the additional adjacent conductors.

14. The semiconductor structure of Claim 1 wherein the gap is in the range of 0.1 to 2.0 microns.

15. A method for providing a high performance semiconductor structure having first and second adjacent conductors on a substrate comprising the steps of:

forming a first conductor on the substrate;

depositing a first high dielectric constant material adjacent to at least one side of the first conductor; and

forming a second conductor adjacent to the first high dielectric constant material.

16. The method of Claim 15 further comprising disposing an electrically conductive diffusion barrier material between the first high dielectric constant material and each of the first and second conductors.

17. The method of Claim 15 wherein the first and second conductors are fabricated on the substrate surface.

18. The method of Claim 17 further comprising the steps of:

depositing a second high dielectric constant material on the surface one of said first and second conductors; and

forming a third conductor over the second high dielectric constant material.

19. The method of Claim 18 further comprising depositing an electrically conductive diffusion barrier material between the second high dielectric constant material and the third conductor.

20. The method of Claim 15 wherein the second conductor is formed over the first high dielectric constant material at a successive layer of said structure.